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CONTRIBUTION TO
MEMORANDUM TO HOLDERS OF
NIE 11-1-67: THE SOVIET SPACE PROGRAM

Expenditure Implications of Estimated Soviet Space Programs 1963-72

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WARNING

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Note

This contribution has been prepared in response to the Terms of Reference for the Memorandum to Holders of NIE 11-1-67: The Soviet Space Program.

For costing purposes, the schedules and target dates for projected space programs had to be made more explicit than those contained either in the National Estimate or in the contribution to this Memorandum to Holders prepared by the Guided Missiles and Astronautics Intelligence Committee (GMAIC) of the USIB. For this reason data on future costs of the Soviet space effort, in particular, should be considered tentative and subject to revision as new information becomes available on the progress of individual Soviet programs.

The judgments contained in this contribution represent the current views of the Office of Strategic Research and have not been coordinated with other Offices of CIA.

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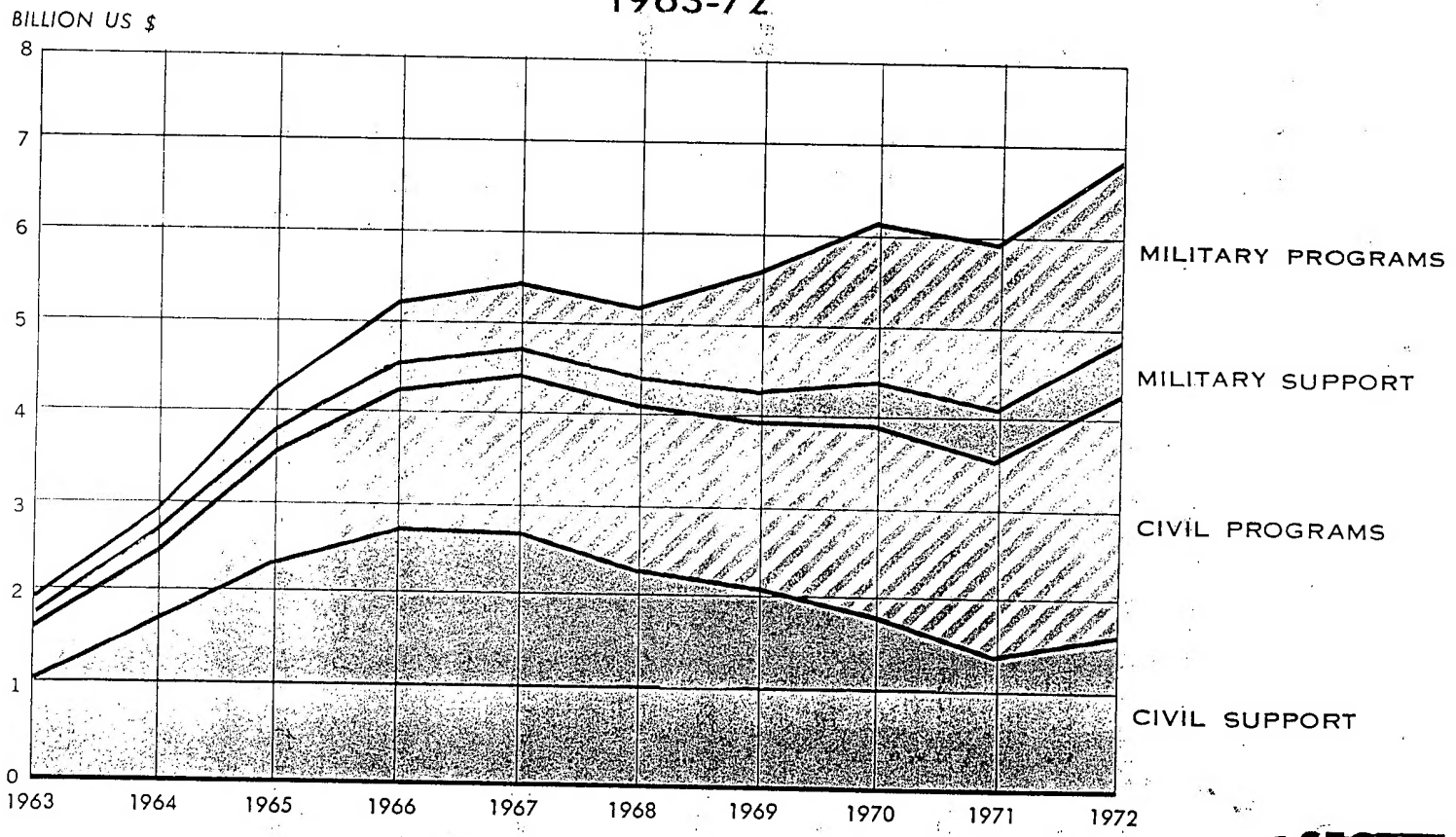
Figure 1

EXPENDITURE IMPLICATIONS OF ESTIMATED SOVIET SPACE PROGRAMS 1963-72



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GROUP 1

Expenditure Implications of Estimated Soviet Space Programs, 1963-1972

Summary

Estimated costs of the Soviet space program* for the period through 1969 do not differ significantly from the expenditure judgments in NIE 11-1-67. Our calculations still show that the Soviet space effort --if it had been purchased in the US--would have amounted to about $2 billion in 1963 and would have grown to about $5 billion by 1966. The period of very rapid growth in outlays for space ended in 1967 when the heavy investment in support facilities for major new Soviet launch systems reached its peak. (See Figure 1.)

During 1968 and 1969 the Soviets will probably be able to achieve the space objectives implied by currently estimated programs and still hold overall spending to about the 1966 and 1967 levels--the equivalent of $5 billion to $5.5 billion a year. After that, the total resources required for space could again increase if the USSR pursues programs designed to achieve a manned lunar landing in 1971-72 and a large space station in the 1975-80 period, while continuing the other individually less costly programs identified in the Estimate.

Costs of military space programs--defined to include a portion of the manned space effort--will probably grow appreciably faster after 1969 than civil program costs possibly reaching as much as

* *Direct information on actual Soviet expenditures for space is not available. The estimates reflect the costs of known and estimated Soviet programs as though they had been incurred in the United States. The cost estimates are intended to convey an appreciation of the approximate size and composition of the Soviet space effort measured in financial terms.*

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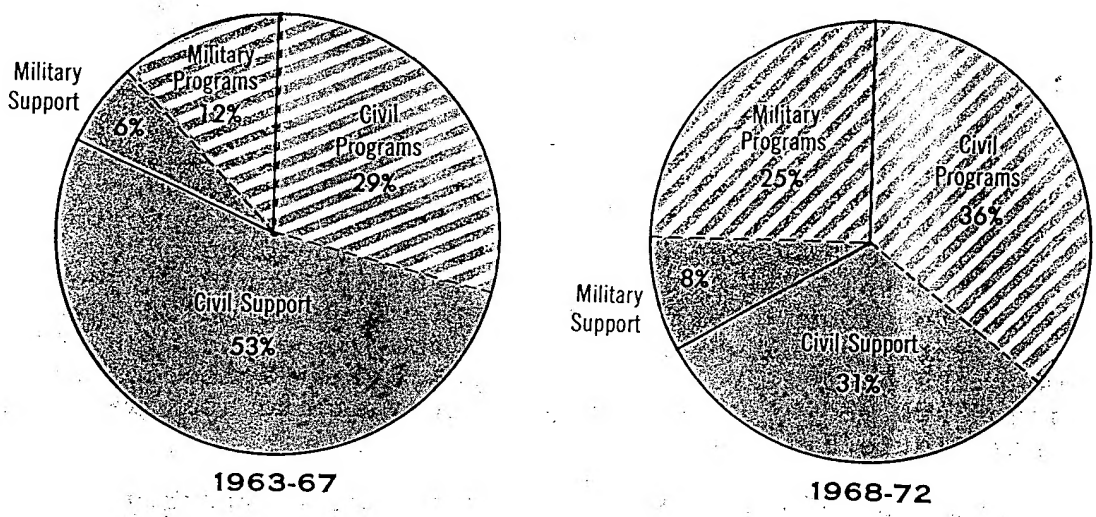
COMPOSITION OF SOVIET MILITARY AND CIVIL SPACE EXPENDITURES*

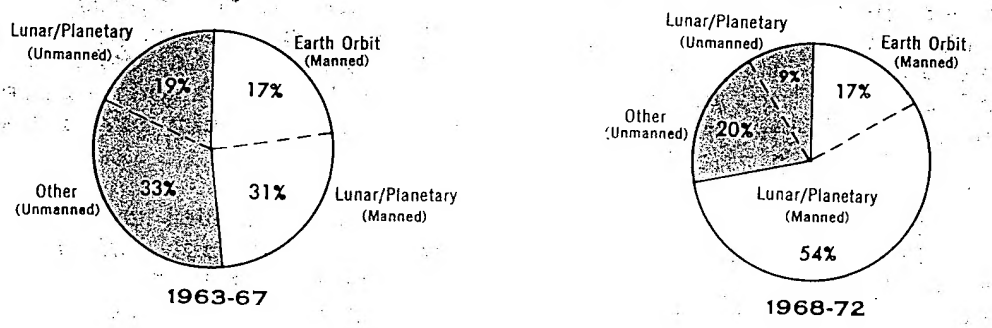
1963-67 and 1968-72

Figure 2

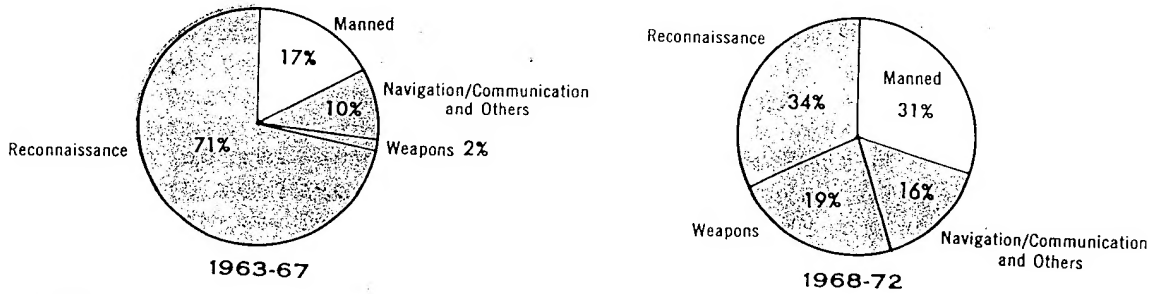
TOTAL SOVIET SPACE PROGRAM EXPENDITURES



SOVIET CIVIL SPACE PROGRAM EXPENDITURES



MILITARY SPACE PROGRAM EXPENDITURES



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*The pattern of allocation of resources among Soviet space programs is that implied by the programs identified in this contribution and in existing National Estimates. Projections into the future contain programs which have not in all cases been confirmed.

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one-third of the total effort during 1968-72. (See Figure 2.) The dominant share of costs attributed to military objectives is made up of manned space programs and applied satellites in the reconnaissance, navigation, and communications fields.

After 1969, a substantial effort for potential weapons development would be required if the USSR seeks to keep future options open for co-orbital antisatellite systems, penetration aids, and multiple orbit weapons systems. Costs specified in this contribution for such purposes include only outlays for research and prototype design and development and do not imply deployment. If the Soviets do not view these as promising military systems and forgo development work on them, the growth would be less than that shown in Figure 1, although outlays for military space would still probably double in size from about $1 billion in 1968 to about $2 billion in 1972.

I. Civil Space Program Costs*

The pattern of expenditures for civil programs shown in Table 1 (see the appendix) reflects the GMAIC judgment that the Soviets are "more likely" to accomplish a manned lunar landing in 1971-72 than earlier. The cost implications for other civil programs are based on the judgments of NIE 11-1-67.

Expenditures for almost all manned space flight programs in the Soviet space effort have experienced steady growth in the past few years. The estimated manned lunar landing program is, however, the single program most responsible for the high level and rapid growth of expenditures for civil space. Other civil programs include the now completed Vostok-Voskhod program, the Soyuz development program, a circumlunar project, and a small space station (50,000 pounds and three or so men). About 50 percent of total outlays for these programs through 1967 were absorbed directly by the manned lunar landing undertaking.

Several cost alternatives for the manned lunar landing program are shown in Table 2. Total program costs for the manned lunar landing could vary between $16 billion and $22 billion depending upon the selection of alternatives, operational techniques employed, and the actual degree of adherence maintained with respect to the intended schedule and objectives. While the minimum cost program alternatives have the obvious advantage of economy, the hardware developments associated with the more expensive cost alternatives would greatly increase future Soviet manned space options beyond the lunar landing and for this reason might look attractive to the Soviets. The detailed cost estimates used in this contribution reflect the use of program alternative II as defined in Table 2.

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* *We have been requested by the Office of National Estimates to distinguish between costs of civil and military programs. The distinction used is the US institutional pattern of program funding. While this permits gross comparisons between US and Soviet data so constructed, it probably is not the way the Soviets view their space costs.*

The expenditure implications of future manned civil space programs contained in this contribution include those for establishing a lunar base and a large space station (250,000 pounds with a crew of 20 to 25). Neither of these programs is expected to be advanced enough by 1972, however, to require sizable outlays. Program timing reflects the judgment of the Estimate that a lunar base will follow the manned lunar landing by several years and that it is unlikely the Soviets will attempt to orbit a large space station at the same time they are conducting their initial lunar landing mission.

If the program schedules for the large space station were to be accelerated, total expenditures in the 1968-72 period could rise appreciably. Costs for both the small and large space stations considered in this contribution have been divided equally between the civil and military accounts.

Space science and applications have accounted for about 55 percent of total Soviet civil space program expenditures to date, but their relative share has been declining in recent years and this trend is expected to continue. Future emphasis probably will be focused on applied satellites in response to directives of the 23d Party Congress (1966).

Both the Molniya communications and the Meteor meterological satellite systems are nearly operational. A substantial amount of additional funds could be spent for an advanced satellite broadcasting system, particularly if the Soviets were to use this technique to further their international propaganda effort. Heavy Soviet participation in international-regional communication systems beyond that currently anticipated could also require large amounts of money in addition to the outlays covered by this contribution.

II. Military Space Program Costs

Little is actually known of the institutional framework within which the Soviet space program is operated, but the effort appears to be handled without the institutional distinction between civil and military programs that exists in the United States. The cost series most affected by the distinction

between civil and military programs is in the program for manned space stations. Because of the uncertainty concerning Soviet intentions for the use of such stations, their costs are now arbitrarily divided equally between the civil and military accounts.

About three-quarters of military space program expenditures through 1967 have been invested in the satellite reconnaissance program in accordance with the high priority ascribed to this effort by the USSR. (See Table 3.) Expenditures for reconnaissance will probably continue at the current annual level of about a half billion dollars through 1972. Moderately higher expenditures would result if the Soviets develop an advanced multisensor reconnaissance system in addition to the maneuverable system now included in the cost implications of the Estimate.

The rapid pace of US military technology may stimulate the USSR to pursue the development of weapons systems options in the space field. If development work is begun on offensive and defensive space weapons systems during the next five years, the more likely systems to be considered would include a multiple orbit bombardment system (MOBS), an unmanned co-orbital antisatellite interceptor, and an orbiting penetration aid system. Development and design costs might reach as much as a half billion dollars a year by 1971, if all these programs are pursued concurrently with the aim of providing deployment options during the 1975-80 period.

III. Support Costs

Support costs are those expenditures associated with the Soviet space effort which cannot be assigned uniquely to specific programs. While all clearly identified civil and military space projects are carried as expenditures under the appropriate budget account, a significant amount of Soviet space activity does not fall neatly into this accounting structure.

Activities which constitute a common service--tracking and data acquisition, launch and other test facilities, basic supporting research, and administration, for example--are considered support program costs. Advanced research and launch vehicle development with either an undefined or potentially common purpose are also carried in the support account.

Support expenditures declined in 1967 in relation to total Soviet space costs and will continue to do so. This decline results from the decreasing expenditures for launch vehicle development, the largest single item in the support category.

Most of the funds involved in developing an independent class of large vehicles for space work probably had been spent by the end of 1967. Although few vehicles have been flown, launch support facilities to accommodate Soviet space programs for a number of years to come are believed to be nearing completion. No additional activity is foreseen in these support categories that is large enough to have a marked effect on future expenditure levels.

The three cost elements in the civil support category that are expected to increase in the future are advanced research, administration, and international projects. Research and administration are estimated to increase in direct proportion to total space costs. Funds allocated by the Soviets for international projects also are expected to increase in the next few years. Although only limited expenditures have been made to date for this type of activity, the current Soviet-French space negotiations may be a prelude to much more activity in this area.

Military support expenditures remained relatively constant through 1967 and are not expected to grow much more through 1972. The only activity which might add much to spending here would be the unanticipated development of a new space booster family designed exclusively for military space applications. Such a booster program has not been included in the cost implications in this contribution.

Statistical Appendix

The costing methodology that underlies the statistical data presented in this contribution is based on intelligence estimates and projections of Soviet space programs and employs appropriate US cost analogs and techniques to reflect the costs of the Soviet space program in dollars as if they had been incurred in the United States. The original construction costs of facilities and development costs of hardware used initially or primarily for military weapons purposes are not included in our expenditure estimates. The costs of constructing facilities for an exclusive space purpose and the costs of modifying, adapting, or utilizing other facilities and hardware --often on a cost-sharing basis--are included, however.

Expenditure estimates for future space programs necessarily have a broader range of uncertainty than expenditure estimates for past or current programs and should be viewed generally as reference levels implied by a particular set of programs having specified characteristics. Also, the reliability of the expenditure estimates declines as the data become more detailed. For example, an estimated level of expenditures for any single year must be viewed with less confidence than the cumulative expenditures for a span of years.

At the extremes, actual Soviet outlays for space could be considerably higher or lower than the single-valued series presented in this contribution. On the upper side, annual resource commitments for space could reach the equivalent of $7.5 billion to $8 billion by 1972 if the USSR concurrently pursues the full family of programs estimated in National Estimates to be within its technological grasp. If, on the other hand, the USSR adopts a much more economy-minded and less-competitive program, the costs might be reduced to the equivalent of about $4.5 billion. This lower level would still permit pursuit of most civil programs at their present scheduling rates, although the large space station and lunar base programs probably would be delayed by

two to three years. Development of a capability in advanced military systems, however, such as Sigint satellites, an independent military communications satellite system, MOBS, and penetration aid satellites might be delayed much longer.

The format of this year's contribution differs from that of last year in that the civil and military categories of expenditures are broken down into the subcategories of expenditures for programs and for support. The new breakdown allocates support to the civil and military accounts separately, including expenditures on launch vehicle development, advanced research, tracking and data acquisition, construction, and administration. Previously, support expenditures were charged entirely to the civil space program.

Details on annual cost schedules for both program and support activities are shown in Tables 1 and 3. Alternative cost profiles for the manned lunar landing program are presented in Table 2.

Table 1

Expenditure Implications of Soviet Civil Space Programs by Calendar Year, a/
1963-72

	Before 1963	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	Total
	Million US $											
Civil programs	1,520	580	700	1,150	1,560	1,800	1,800	1,880	2,110	2,170	2,630	17,900
Of which:												
Manned	490	90	110	440	930	1,190	1,260	1,320	1,460	1,540	2,030	10,860
Science and applications	1,030	490	600	700	620	620	540	560	660	640	600	7,050
Civil support	1,930	1,020	1,740	2,400	2,700	2,640	2,260	2,040	1,800	1,340	1,600	21,460
Of which:												
Launch vehicle development b/	1,000	610	1,110	1,520	1,690	1,600	1,340	1,130	870	480	560	11,910
Advanced research	250	120	180	270	320	340	310	300	300	260	320	2,980
Tracking and data acquisition	30	20	40	60	70	60	60	60	60	80	100	660
Construction	200	60	80	80	60	40	20	30	40	40	40	680
International projects					10	10	10	10	20	20	20	80
Administration	450	210	320	460	560	580	530	510	510	460	560	5,140
Total	3,450	1,600	2,440	3,540	4,250	4,440	4,060	3,930	3,900	3,510	4,230	39,360
	Percent											
Civil as a percent of total space expenditures	85	81	83	82	82	82	78	71	65	59	62	74

a. Data are rounded to the nearest 10 million and totals are independently rounded.
b. Includes all launcher development costs for manned space stations.

Table 2

Estimated Total Program Costs for Alternative Soviet
Manned Lunar Landing Programs

	Alternatives [a]			
	I	II	III	IV
	Million US $			
Spacecraft development				
Soyuz spacecraft	500	500		
New spacecraft			3,000	3,000
Launch vehicle development				
Booster based on SL-9	2,000		2,000	
All new booster		4,100		4,100
Program costs				
Soyuz program	5,900	5,900		
Program based on new spacecraft			6,700	6,700
Other costs	7,800	7,800	7,800	7,800
Total	16,200	18,300	19,500	21,600

a. The alternative assumptions are based on the use of:

I - Soyuz spacecraft and booster based on SL-9.
II - Soyuz spacecraft and all new booster.
III - New spacecraft and booster based on SL-9.
IV - New spacecraft and all new booster.

Table 3

Expenditure Implications of Soviet Military Space Programs by Calendar Year, a/
1963-72

	Before 1963	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	Total
	Million US $											
Military programs	380	240	310	500	640	740	840	1,220	1,610	1,840	1,960	10,270
Of which:												
Manned Applications				80	170	160	190	360	510	620	680	2,750
	380	240	310	420	470	520	560	700	800	800	830	6,040
Of which:												
Reconnaissance	370	210	270	360	400	480	500	550	560	460	460	4,620
Weapons						60	80	170	300	420	450	1,480
Military support	240	150	200	260	280	260	280	380	490	560	600	3,700
Of which:												
Launch vehicle development	90	60	60	60	40	20	10					320
Advanced research	50	30	40	60	70	70	80	120	160	190	200	1,080
Tracking and data acquisition	20	10	20	30	30	40	40	40	40	40	50	340
Construction		10	20	20	20	20	10	10	10	10	10	110
Administration	80	50	60	100	120	120	140	220	280	320	340	1,860
Total	620	380	500	760	920	1,000	1,120	1,600	2,100	2,400	2,560	13,970
	Percent											
Military as a percent of total space expenditures	15	19	17	18	18	18	22	29	35	41	38	26

a. Data are rounded to the nearest 10 million and totals are independently rounded.